B1 Cont'd

pumping electromagnetic radiation, and wherein the exciting power is a pump power of said pumping electromagnetic radiation.

REMARKS

This paper responds to the Office Action dated June 5, 2002.

Claims 37-71 were pending at the time of the Office Action. Claims 37-71 have been canceled and new claims 72-107 have been added. The new claims correspond roughly with the old claims as follows:

original	1, 9	2	3	4	5	6	7	8	10
previous	37	38	39	40	41	42	43	44	45
present	72	73	74	75	76	77	78	79	80

original	11	12	13	14	15	16	17	18	19
previous	46	47	48	49	50	51	52	53	54
present	81	82	83	84	85	86	87	88	89

original	20	21	22, 9	23	24	25	26	27	28
previous	55	56	57	58	59	60	61	62	63
present	90	91	92	93	94	95	96	97	98

original	29	30	31	32	33	34	35	1, 9, 36
previous	64	65	66	67	68	69	70	71
present	99	100	101	102	103	104	105	106

Section 112. In the Office Action, the Examiner makes some rejections based on 35 USC §112. It is hoped that the new claims overcome these rejections.

Section 103. In the Office Action, the Examiner rejects all claims on the view that they are obvious over two references. Applicant's previous arguments were not considered because, in the Examiner's view, they were based on the claim preamble. The Examiner stated that the phrase "for emitting pulsed radiation" would not be given any patentable weight.

It appears to the applicant that the previous claims were clearly directed to a pulse generating laser. To avoid any further question about this, in the new set of claims, the applicant has nevertheless introduced the generation of laser pulses as separate and distinctly listed feature in the claims. It is hoped that this will permit the Examiner to consider this limitation in reaching a view as to patentability.

It is suggested that these new claims do not present a need for substantial additional work, since the newly set forth limitation in the claims is not a new feature in the claims but has merely been introduced for clarity reasons.

In the office action, the Examiner stated that the subject matter of the former claims was made obvious over Kasamatsu et al. (Applied Optics, Laser-Diode-pumped Nd:YAG active mirror laser, "Kasamatsu") and Weingarten et al. US Pat. No. 5,987,049 ("Weingarten"). It is respectfully suggested that the subject matter of the new independent claims is not made obvious by the cited references.

Kasamatsu shows a thin-disk laser, the thin-disk laser medium being mounted on a cooling surface. However, Kasamatsu shows a *continuous-wave* (cw) laser (see page 1879, second column), and *not a laser for emitting pulsed electromagnetic radiation* **as explicitly set forth among the limitations of the present claims.**

The requirements for continuous-wave lasers differ in many aspects from the requirements for of

pulsed lasers. Whereas the cavity of cw lasers is designed to provide a monochromatic, coherent output beam, in pulse-generating lasers the cavity has to be designed to optimize the pulse duration (i.e. to provide short pulses) and/or the repetition rate. For example, in mode-locked lasers, the cavity lengths directly defines the pulse repetition rate. This means that in order to obtain the desired high pulse intensity, the cavity has to be of a much greater size for pulse generating lasers than for the laser of Kasamatsu. More generally, there are fewer degrees of freedom available to the designers of pulse-generating lasers.

For these reasons, cw lasers and pulse-generating lasers are completely different fields, in which different search groups are active, which concern different laser manufacturing industries etc. For example, the assignee of this application is a manufacturer of pulse generating lasers and would not have the know-how for fabricating a competitive cw laser. The expert in the field of pulse-generating lasers would thus never consider the Kasamatsu reference. However, even if we were to assume for sake of discussion that he would, the following comments would apply.

The examiner correctly points out that Weingarten discloses a semiconductor saturable absorber mirror (SESAM) for passive mode locking of a resonator. However, the laser shown by Weingarten is merely a low average output power pulse generating laser.

In fact, SESAMs as such have been known in the art for several years now. However, the expert has *no motivation whatsoever* to introduce such a SESAM into the laser device of Kasamatsu. SESAMs are exclusively useful for mode-locking in pulsed lasers. Introduced in a cw laser such as Kasamatsu's, they would inevitably render the laser unusable. None of the cavity design parameters would be suited for a pulse generating laser (see the description by Kasamatsu on pages 1879-1880). Additionally, SESAMs bring about losses (saturable and non-saturable losses). They also are delicate parts which tend to be thermally damaged quite easily. Compared to the teaching of Kasamatsu, a cavity for a *pulse generating laser* would have to be redesigned from scratch in order to function properly.

More generally, the expert will *not consider* introducing a saturable absorber in a high average output power laser such as a cooled-thin-disk-laser. The reasons for this are set out on page 4 of

the specification of the present application. They are also described in the German patent application publication DE19907722, mentioned at page 4 of the specification. Lines 17-30 of Column 2 of this publication translate as follows:

> For laser systems with high power (some 100mW) and on another basis (cf. e.g. EP0492944A2) a method for passively mode locking by means of a Kerr lens device was provided, wherein no hints towards an application in high power laser systems with ultra-short pulses can be found, though. Rather, further progress has been achieved using semiconductor based saturable absorbers (SESAMs), which, however, have proven to be too short-lived for high power laser systems, regarding their applicability for powers above some 100mW. On the other hand, non-linear optical methods are preferred, since they are power scaleable by means of appropriate focussing of the beam, and since they do not rely on direct absorption of radiation.

It is an *achievement* of this invention as defined in the independent claims to have *considered and reduced to practice* introducing saturable absorbers into a laser with a laser gain medium having two end faces, and at least one of said end faces comprising a cooling surface, i.e. a laser being designed for high power operation.

Reconsideration is again respectfully requested.

Respectfully submitted,

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